4. Training and Securing Human Resources for Science, Technology, and Innovation

FY2020 budget request: 29,299 million yen
(Budget for previous fiscal year: 24,699 million yen)
*Estimated amount included in management expenses grants

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Implement various intense measures to develop and support the success of diverse human resources leading science, technology, and innovation (STI)

Nurturing and promoting the success of young researchers

Fostering and promoting the success of young researchers in Japan

◆ **Leading Initiative for Excellent Young Researchers (LEADER): 2,004 million yen (1,756 million yen)**
Support researchers and research institutions so that outstanding young researchers can obtain a stable and independent research environment in industry-academia-government-research institutions and concentrate on independent and autonomous research

◆ **Project for the Strategic Fostering of World-Class Researchers: 665 million yen (240 million yen)**
To improve research productivity in Japan, incorporate insights obtained from best practices in Japan and abroad, develop a program for fostering world-class researchers, and build a system to foster researchers on an organization level (rather than on a laboratory level) that also support researchers in getting their papers published in top journals and obtaining overseas research funds

◆ **Data-Related Human Resources Development Program: 576 million yen (303 million yen)**
Universities and companies form a consortium, develop and implement training programs for doctoral students in various fields to acquire skills in data science, etc., so that they can play an active role in various settings. The consortium also works with high schools etc. to promote exploratory learning in AI, mathematics and data science.

◆ Japan Research Career Information Network (JREC-IN Portal): 163 million yen (126 million yen)

This program proactively provides research opportunities for excellent young researchers.

◆ **Research Fellowship for Young Researchers: 18,931 million yen (15,627 million yen)**
This program provides research incentives to outstanding young researchers, giving them opportunities to concentrate on research and helping them improve their abilities as researchers.

◆ Program to Foster Researchers with Enhanced International Competitiveness: 279 million yen (111 million yen)

Foster and secure diverse human resources who will lead innovation

◆ Development and Promotion of Success of Program Managers: 117 million yen (117 million yen)

◆ **Exploration and Development of Global Entrepreneurship for NEXT Generation (EDGE-NEXT): 507 million yen (384 million yen)**
Enhance venture creation capabilities with an eye to improving entrepreneurial activity and fostering entrepreneurship

Researcher

Postdoctoral

Graduate school

University

Opportunities for growth through friendly competition in each stage of education

Further increase interest in science, technology, mathematics, and discover and expand students' talents

◆Inter-college Science Competition: 65 million yen (65 million yen)

Japan High School Science Championships

International science and technology contests

Japan Junior High School Science Championships

Promotion of active participation of female researchers

◆ **Initiative for Realizing Diversity in Research Environment: 1,175 million yen (1,008 million yen)**
Support initiatives by universities and other organizations to achieve diversity, which promote the development of female leadership through the enhancement of research capabilities of female researchers and the development of an environment where they can continue their career as a researcher regardless of childbirth, childcare, and other life events

◆ Research Fellowships for Young Scientists (RPD): 1,050 million yen (930 million yen)
Provide research scholarships and other support so that excellent researchers can return to their laboratories smoothly after leave due to childbirth or childcare (RPD: Restart Postdoctoral Fellowship)

Developing human resources who will lead the next generation of STI

◆ **Support for Super Science High Schools (SSHs): 2,415 million yen (2,219 million yen)**
Designate high schools that provide advanced science and mathematics education as SSHs and provide support for them

◆ Global Science Campus Program: 504 million yen (419 million yen)

◆ Junior Doctor Training School: 300 million yen (240 million yen)
Support universities' activities for the development of students with outstanding talents in science and mathematics

High school

Elementary and junior high school

◆ Program for Supporting Female Junior and Senior High School Students in Choosing to Major in Sciences: 50 million yen (43 million yen)
Promote ongoing initiatives in communities to raise interest of female junior and senior high school students in the science field and allow them to include science as one of their career choices in an unbiased manner

Leading Initiative for Excellent Young Researchers (LEADER)

FY2020 budget request: 2,004 million yen
(Budget for previous fiscal year: 1,756 million yen)

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Background/Challenge

- With **the working-age population declining further** into the future, it is necessary to efficiently and effectively **use the power of young researchers**, who are valuable and highly skilled human resources, across the whole society. It is necessary to **promote matching between young researchers and research institutions** in the academic, industrial, and government sectors, which will lead to the promotion of STI and the sustainable development of Japan.
- In particular, it is very important that **research institutions in the academic, industrial, and government sectors provide a stable and autonomous research environment** for outstanding young researchers so that they can concentrate on independent and autonomous research.

Program Overview

[Purpose and objectives]

- Provide support to researchers and research institutions so that outstanding young researchers can obtain a stable and independent research environment at research institutions in the academic, industrial, and government sectors, where they can concentrate on independent and autonomous research.

[Program overview]

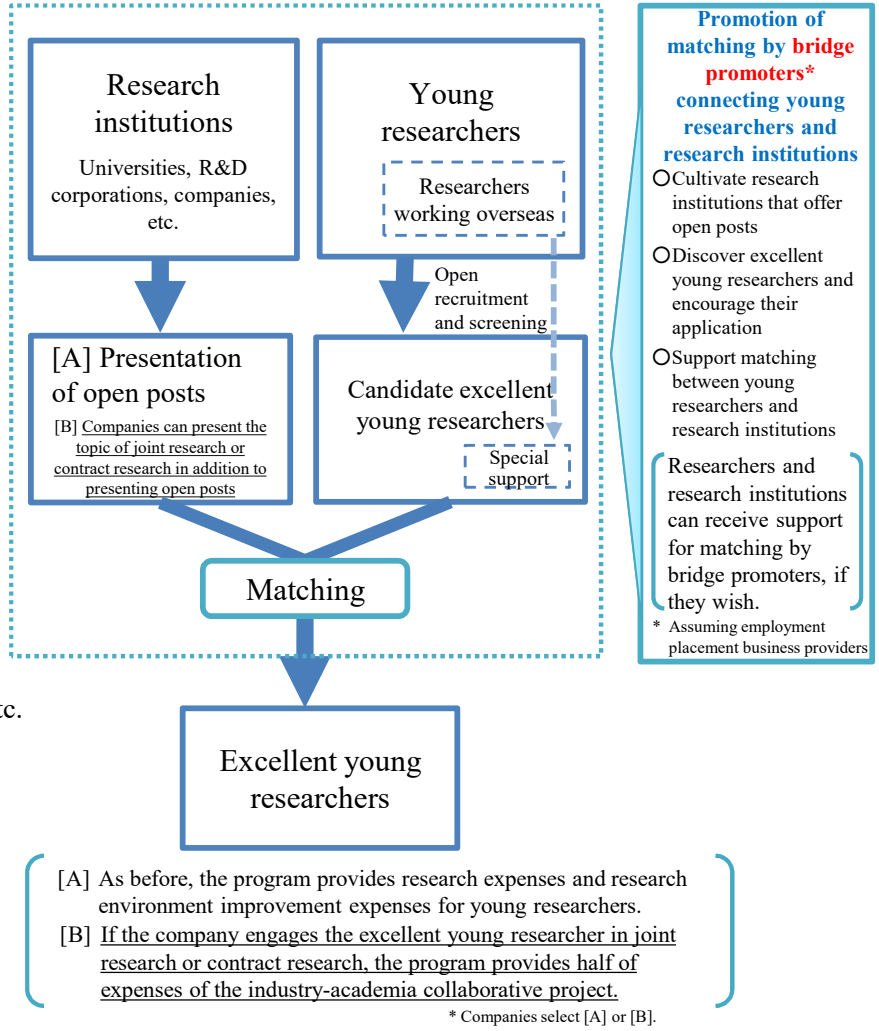
(1) MEXT creates and publishes a list of job openings from universities, R&D corporations, companies, etc. who wish to accept outstanding researchers
(2) MEXT selects candidate excellent young researchers through open recruitment and rigorous screening.
(3) The recruiting research institutions negotiate with the candidates. Once the terms of employment are agreed, MEXT recognizes these candidates as excellent young researchers.
In this process, bridge promoters work to promote matching between young researchers and research institutions.
(4) MEXT provides research funds, etc. for a certain period of time for research institutions that accepted excellent young researchers

* Special support is provided for researchers who are returning to Japan after working for a top-class overseas research institution.

[Program scheme]

✔ Scope: National and private universities, national R&D corporations, private companies, etc.
✔Number of researchers: About 370 (including about 100 newly hired)
✔Details of support [A] Research expenses for young researchers: 6 million yen per year (upper limit)/person (2 years)[1]
Research environment improvement expenses: 2-4 million yen per year (upper limit)/person (5 years)
*1 For humanities and social sciences, up to 4 million yen
[B] Expenses for industry-academia collaboration projects: 10 million yen/year (upper limit)/person (up to 5 years)[2]
*2 Joint research projects using the cross appointment system and secondment system are also in the scope. The subsidy rate is 1/2, and the maximum amount is the amount paid by the collaborator company. If the joint research starts in the second year, only research environment improvement expenses will be paid for the first year.

[Program structure]



Project for the Strategic Fostering of World-Class Researchers

FY2020 budget request: 665million yen
(Budget for previous fiscal year: 240 million yen)

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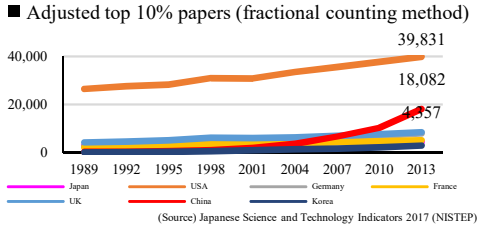
Background/Challenge

- With Japan's international position in terms of the number and quality of papers declining and its population falling, Japan faces an urgent need to improve the research productivity of researchers in order to strengthen its research capabilities.
- Therefore, with reference to overseas efforts, the government will develop a program for the fostering of world-class researchers and establish a system to foster researchers on an organizational level, rather than on a laboratory level. This program aims to promote the strategic development of researchers who can play an active role in the world with world-class research and management skills so that they can also obtain research funds from overseas.



(Source) Japanese Science and Technology Indicators 2017 (NISTEP)

Program Overview

[Purpose and objectives]

- In order to improve research productivity in Japan, the government will develop a program to foster world-class researchers incorporating insights of best practices from Japan and overseas. This program supports universities and research institutions that build a strategic system to foster outstanding researchers on an organization level (rather than on a laboratory level), which also support researchers in getting their papers published in top journals and obtaining overseas research funds.
- Also, in order to develop more effective programs efficiently, the Researcher Development Program Formulation and Promotion Committee consisting of representatives of each organization and academic experts has been established to collect and analyze the knowledge held by individual organizations and information on best practices from overseas, develop standard models and common menus for researcher development programs in Japan, and feed back to each institution to continuously improve the programs, while also working with academic societies and university organizations in developing measures to spread the developed programs.

[Program scheme]

- ✔ Scope: National and private universities, R&D corporations
  (Consortiums consisting of multiple institutions are also included in the scope.)
- ✔ Subject organizations:
  About 6 (including about 4 new organizations)
- ✔ Program scale:
  About 81 million yen/institution per year (10 years)

New initiatives in FY2020

- Support outstanding young researchers in conducting research activities and participating in training at overseas research institutions

[Conditions of support]

- In anticipation of changes in Society 5.0, the organization strives to create an environment in which researchers with diverse backgrounds can grow through friendly competition beyond the border between humanities and sciences, promoting STI creation.

  The institution strives to create an environment where returnees from overseas research institutions, foreign researchers, and researchers from different fields and institutions work together and grow through friendly competition.
  *Researchers from other institutions who fulfill participation conditions are also accepted.

- The institution has made voluntary efforts to secure young researchers, such as the reform of the personnel and salary management system.

Schematic diagram

■ Researcher Development Program Formulation and Promotion Committee

- Aggregate and analyze knowledge held by individual organizations and provide feedback to each organization
- Develop measures to spread the program in cooperation with academic societies and university organizations

Academic societies, etc. Collaboration

Sharing knowledge ↑ ↓ Feedback

- Meeting and secretariat expenses
- Information collection and analysis expenses

■ Universities and R&D corporations

- Program development and demonstration expenses (including research expenses, travel expenses, etc.)

■ Vitae Researcher Development Framework (RDF) (UK)

Visualize and systematize programs to foster world-class researchers strategically

<Example of a researcher development program>

Education program	□ Provision of opportunities to gain experience overseas (research activities at overseas research institutions, etc.) □ Provision of interdisciplinary exchange opportunities (joint camps with interdisciplinary researchers, etc.) □ Development of transferable skills (research and management skills, etc.)
Research guidance	□ Guidance by mentors
Research environment improvement	□ Effort management (securing research time) □ Sharing research facilities and equipment

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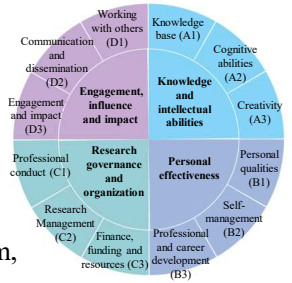

- Demonstration of program menu, implementation method, training environment, implementation system, etc. at each institution.

Data-Related Human Resources Development Program

FY2020 budget request: 576 million yen
(Budget for previous fiscal year: 303 million yen)

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Background/Challenge

- In order for Japan to bring about a prosperous society as the world's first country to be faced with a declining birthrate and aging population, it is necessary to strengthen the country's industrial competitiveness by combining AI technology with technologies that allow Japan to exert its strengths, while also using AI technology to complement decreasing labor force and enhance productivity. However, it is expected that in Japan, there will be a significant shortage of IT human resources who can fully utilize AI technology.
- Among IT human resources, it is expected that there will be a shortage of expert human resources who can lead a team of data scientists and take initiative in using big data in organizations. It is necessary to develop educational programs to foster advanced human resources.
- There is also a need to develop human resources to lead the next generation of AI technology. It is necessary to enhance education in the fields of AI and data science at high schools.

Program Overview

[Purpose and objectives]

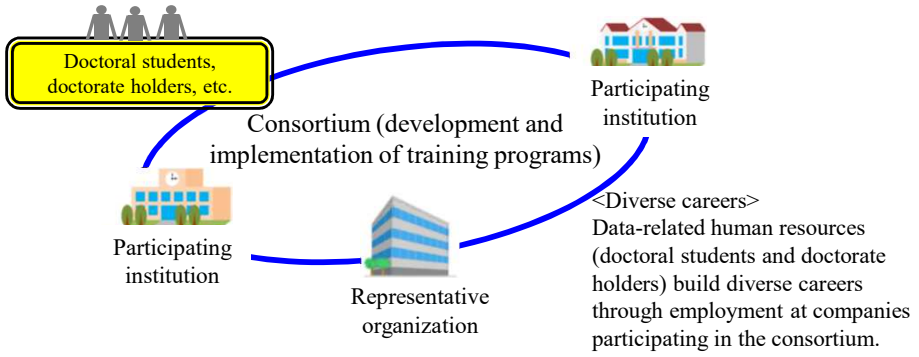
- Develop and implement training programs to turn doctorate holders in each field into top-class expert human resources who can play an active role in the academia, industry and education sectors utilizing data science.
- Promote exploratory learning on AI, mathematics, and data science in collaboration with high schools, etc. that are taking advanced initiatives in these fields.

[Program overview and schematic diagram]

- In order to foster high-level data-related human resources and support their success in various fields across society, universities, companies, etc. form a consortium to develop and implement a training program to equip high-level human resources, such as doctoral students and doctorate holders, with data science skills, and support their career development.

New initiatives in 2020

- Courses on high school education are added to the training program to foster human resources to work in the education sector, with an eye to fostering high school students who will lead next-generation AI technology.
- Exploratory learning on AI, mathematics, and data science is promoted in collaboration with high schools, etc. that are taking advanced initiatives in these fields, by means such as dispatching doctorate holders to such schools. The special certificate system and the part-time teacher system will be also utilized at high schools.



- ✔ Covered expenses: Expenses for the development and implementation of training programs, expenses for the nationwide dissemination and implementation of such programs, and expenses for the development of high school students who will lead the next generation of AI technology
- ✔ Program period: Up to 8 years (subsidized period is 5 years) *Interim evaluation conducted in the 3rd year
- ✔ Number of subject institutions: About 10 (including about 4 new institutions)

[Program implementers]

- Tokyo Medical and Dental University (Consortium for Big Data and AI in Medicine and Drug Discovery)
- University of Electro-Communications (Data Entrepreneur Fellows Program)
- Osaka University (Kansai Regional Consortium for Data-Related Human Resource Development/National Network)
- Waseda University (Advanced Data-Related Human Resource Development Program)
- Hokkaido University (Consortium for the Development of Human Resources to Manage Next-Generation Smart Infrastructure)

Research Fellowship for Young Researchers

FY2020 budget request: 18,931 million yen
(Budget for previous fiscal year: 15,627 million yen)
*Estimated amount included in management expenses grants

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Program Overview

Recruiting and supporting as a special researcher to give an excellent young researcher the opportunity to concentrate on his or her research while choosing his or her own research subject at an early stage in research life. To foster and secure creative researchers who will lead the future of academic research in Japan.

Doctoral students	Research Fellow (DC)	[Scope: Doctoral students; Research grant: 2.4 million yen per year; Period: 3 years (DC1) or 2 years (DC2)] ○ The program provides grants for doctoral students with excellent research abilities so that they can focus on improving their talents without financial worries. ○ Number of recipients: 4,196⇒5,067 (new recipients: 1,750→ 2,664); Amount of annual research grant (including support for tax increase): 2,400,000 yen → 2,448,000 yen	10,070 million yen ⇒ 12,405 million yen
Postdoctoral fellows	Research Fellow (PD) (SPD)	[Scope: Doctorate holders; Research grant: 4,344,000 yen (PD) or 5,352,000 yen (SPD); Period: 3 years] ○ The program provides grants for doctorate holders with excellent research ability (PD) and those with world-class research ability (SPD) so that they can focus on improving their talents at universities and other research institutions. ○ Number of recipients (PD): 1,000⇒1,171 (new recipients: 305→524); Amount of annual research grant (including support for tax increase): 4,344,000 yen →4,431,000 yen Number of recipients (SPD): 36⇒36 (new recipients: 12→12); Amount of annual research grant (including support for tax increase): 5,352,000 yen →5,459,000 yen	PD: 4,344 million yen ⇒ 5,189 million yen SPD: 193 million yen ⇒ 197 million yen
	Research Fellow (RPD)	[Scope: Doctorate holders who are returning after a break due to childbirth or childcare; Research grant: 4,344,000 yen per year; Period: 3 years] ○ The program provides grants for doctorate holders with excellent research ability who have been taking leave from research due to childbirth or childcare so that they can smoothly return to and focus on research at universities and other research institutions, and continue to improve their ability as researchers. ○ Number of recipients: 214⇒237 (new recipients: 75→87); Amount of annual research grant (including support for tax increase): 4,344,000 yen →4,431,000 yen	930 million yen⇒1,050 million yen

■ Employment after the completion of the fellowship

⇒ **More than 80% acquired a full-time research job.**

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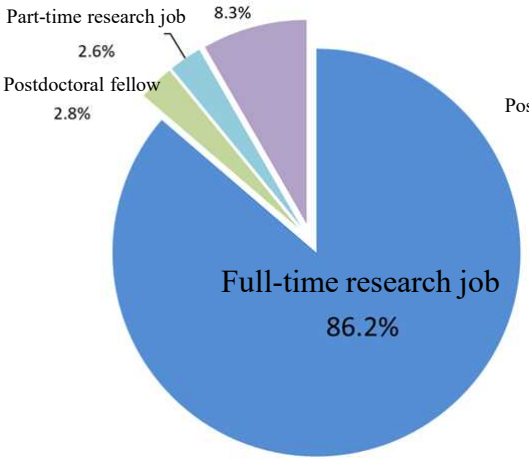
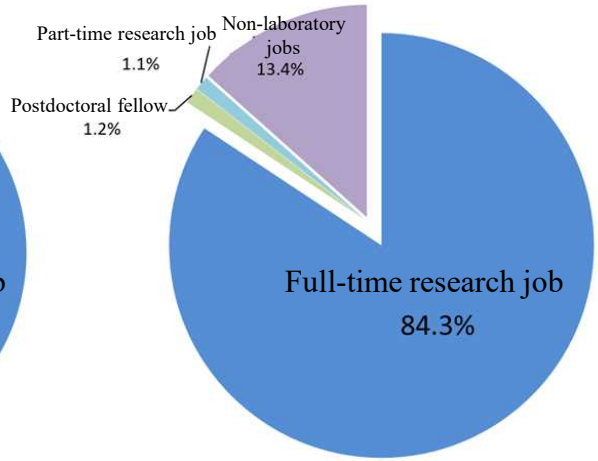
- **Five years after the end of the program period (PD)**



- **Ten years after the end of the program period (DC)**



Source: Survey on Employment of Research Fellows (Japan Society for the Promotion of Science)

■ Outstanding research results of fellow researchers

57.7% of the 156 papers listed in "Japanese Scientists in *Science*" (2015-2017 editions) included in the names of their authors previous or current research fellows.

Source: Created by the Japan Society for the Promotion of Science, based on "Japanese Scientists in *Science*" (2015-2017 editions) (AAAS)

Promotion of the Success of Women in Science, Technology and Innovation

FY2020 budget request: 2,275 million yen
(Budget for previous fiscal year: 1,980 million yen)
*Estimated amount included in management expenses grants

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Background/Challenge

○ In order for Japan as a country with a declining population to ensure the sustainability of the research community and stimulate science, technology and innovation by incorporating diverse viewpoints and excellent ideas, it is important to promote the active participation of female researchers. However, compared to other countries, the ratio of female researchers is still low in Japan (especially in senior positions).

○ The proportion of female students in the undergraduate and graduate schools of the natural sciences, which will lead the next generation, is also low.

Initiative for Realizing Diversity in Research Environment

FY2020 budget request: 1,175 million yen
(Budget for previous fiscal year: 1,008 million yen)

Purpose and objectives

○ Support initiatives by universities and other organizations to achieve diversity, which promote the development of female leadership through the enhancement of research capabilities of female researchers and the development of an environment where they can continue their career as a researcher regardless of childbirth, childcare, and other life events

Support for initiatives for achieving diversity

○ Scope: Universities, national R&D corporations, etc.
○ Program period: 6 years (including 3 years of subsidized period)
○ Supported initiatives:

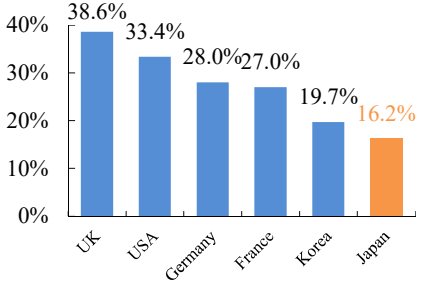
(1) **Institution-led initiatives**: Multiple institutions collaborate with each other to promote the success of female researchers in a specific region or field
(2) **Leadership initiatives**: Female researchers are dispatched to overseas institutions to increase their chance of assuming senior positions in the future.
(3) **Field- or institution-specific initiatives (new)**: These initiatives promote the active participation of female researchers, while also dealing with the characteristics and challenges of a specific research field or research institution and improving research productivity.
(4) **Initiatives by (groups of) core institutions to create national networks**: Core institutions work together to create national networks to study domestic and overseas initiatives and share and disseminate experience and insights nationwide.

○ Amount of grants: Approx. 50 million yen / project per year
(approx.26 projects (including 10 new projects))

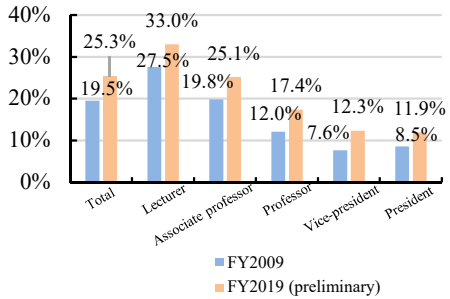
Survey and analysis

○ Scope: Universities, national R&D corporations, etc.
○ Program period: 2 years
○ Supported initiatives: Survey and analysis of outstanding overseas initiatives that contribute to promoting the success of female researchers
○ Amount of grants: Approx. 25 million yen / project per year (approx.2 projects (including 1 new project))

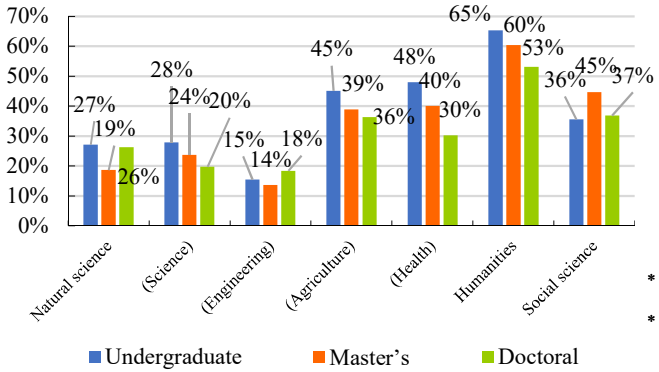
■ International comparison of the ratio of female researchers



■ Percentage of women by faculty position



■ Percentage of women among undergraduate and graduate students



* Created based on basic school statistics
* (Health) is the total for medicine, dental and pharmaceutical departments

Research fellow program (RPD)

FY2020 budget request: 1,050 million yen
(Budget for previous fiscal year: 930 million yen)

○ The program provides grants for doctorate holders with excellent research ability who have been taking leave from research due to childbirth or childcare so that they can smoothly return to and focus on research at universities and other research institutions, and continue to improve their ability as researchers.
○ Scope: Researchers with doctoral degree who are returning from leave due to childbirth or childcare
○ Research grants: 4,431,000 yen
(number of recipients: 237 (including 87 new recipients))
○ Period: 3 years

Program for Supporting Female Junior and Senior High School Students in Choosing to Major in Sciences

FY2020 budget request: 50 million yen
(Budget for previous fiscal year: 43 million yen)

○ With a view to raising interest of female junior and senior high school students in sciences and supporting them in appropriately choosing sciences as their major, this program holds symposiums, experiment workshops, and other events, while also supporting universities, etc. promoting initiatives in collaboration with communities and companies.

○ Scope: Representatives of organizations constituted by universities, research institutes, private companies, and boards of education
○ Supported initiatives: Local initiatives that also encompass parents and teachers, in order to ensure effective approach to supporting female junior and senior high school students in appropriate choosing of sciences as their major
○ Amount of grants: 1.5 to 3 million yen / project per year (approx. 22 projects (including about 17 new projects))
○ Period: 2 years

Initiative for Realizing Diversity in Research Environment

FY2020 budget request: 1,175 million yen
(Budget for previous fiscal year: 1,008 million yen)

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Background/Challenge

○ In order for Japan as a country with a declining population to ensure the sustainability of the research community and stimulate science, technology and innovation by incorporating diverse viewpoints and excellent ideas, it is important to promote the active participation of female researchers. However, compared to other countries, the ratio of female researchers is still low in Japan (especially in senior positions).

○ Therefore, it is necessary to create an environment in which female researchers can continue their research regardless of life events such as childbirth and childcare, and to promote female researchers to a higher position by improving their research capabilities.

Program Overview

Purpose and objectives

○ Support initiatives by universities and other organizations to achieve diversity, which promote the development of female leadership through the enhancement of research capabilities of female researchers and the development of an environment where they can continue their career as a researcher regardless of childbirth, childcare, and other life events

Support for initiatives for achieving diversity

○ Scope: Universities, national R&D corporations, etc.
○ Program period: 6 years (including 3 years of subsidized period)
○ Supported initiatives:

(1) **Institution-led initiatives**: Multiple institutions collaborate with each other to promote the success of female researchers in a specific region or field

(2) **Leadership initiatives**:Female researchers are dispatched to overseas institutions to increase their chance of assuming senior positions in the future.

(3) **Field- or institution-specific initiatives (new)**: These initiatives promote the active participation of female researchers, while also dealing with the characteristics and challenges of a specific research field or research institution and improving research productivity.

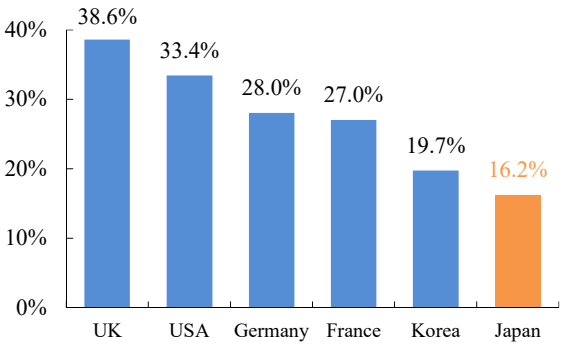
(4) **Initiatives by (groups of) core institutions to create national networks**: Core institutions work together to create national networks to study domestic and overseas initiatives and share and disseminate experience and insights nationwide.

○ Amount of grants: Approx. 50 million yen/year

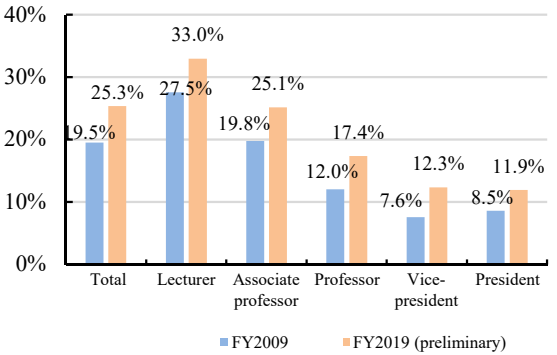
Survey and analysis

○ Scope: Universities, national R&D corporations, etc.
○ Program period: 2 years
○ Supported initiatives: Survey and analysis of outstanding overseas initiatives that contribute to promoting the success of female researchers
○ Amount of grants: Approx. 25 million yen/year

■ International comparison of the ratio of female researchers



■ Percentage of women by faculty position



*Created based on basic school statistics